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## COLOR-NAMES OF ENGLISH SCHOOL-CHILDREN<sup>1</sup>

By W. H. WINCH.

The question whether the color sense of man has undergone an appreciable evolution within historic times is one which, after half a century of discussion, still remains open.

The most considerable work on the color sense of primitive peoples known to me is that done on the Cambridge Anthropological Expedition to the Torres Straits, by Dr. W. H. R. Rivers; and that done on the Fillipinos by Dr. R. S. Woodworth.

A detailed account of the work of the former is given in the second volume of the Cambridge Reports on the expedition to Torres Straits, in part two of the volumes on Physiology and Psychology. Using Lovibond's Tintometer, Dr. Rivers found that high thresholds and defective nomenclature went together; that is to say, peoples who had no name for Blue, for example, had a much higher threshold for Blue than Europeans, whereas for Red, for which they had a well-known name, their threshold was much lower. Other converging evidences seemed to show that there was an order of color development which, after 'Light' and 'Dark,' began with Red, and was followed by Yellow, then by Green and, finally, by Blue. There was thus agreement in the main between the order of development as determined by inferences from language and the probable order as determined by "objective" methods.

The results of Professor R. S. Woodworth's work with the Fillipinos are not yet published; it would therefore be wrong to anticipate his method or conclusions; but I gather from a very able review written by him that he has not been led to conclude that the relationship above indicated between language and sensibility is at all a close one, and that, moreover, among the primitive peoples studied by him, there was no especial lack of sensibility to "Blue."

So far, then, there seems to be no knowledge *current* among anthropological experts capable of deciding the question. However, child study—the term is, perhaps, an unhappy one, and many errors have been committed in its name—may have

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<sup>1</sup>The substance of this paper was read before the British Psychological Society on Jan. 30, 1904.

been more fortunate than anthropology. For, after all, if ontogeny repeats phylogeny in any way whatever, we need not always argue from phylogeny to ontogeny; we can turn our argument about, and child study can help anthropology.

Do observations on the color-sense of children yield results parallel to those of Dr. Rivers, or of Professor Woodworth, or of neither? Is there any definite indication of development at all? I think there is, but I am very far from feeling that the question is settled.

Professor Preyer in *Die Seele des Kindes*, 1881, records experiments with a single child. The test used appeared to depend on the connection between name and color having been correctly established. There seems some doubt as to what his conclusions were. Dr. Holden and Mr. Bosse, in the *Archives of Ophthalmology* XXIX, 1900, say, in summarizing his work, "the greatest percentage of correct responses were for yellow, then for brown, red, violet, black, rose, orange, gray, green and blue in the order named." Dr. Rivers, in the *Popular Science Monthly* of May, 1901, interprets Preyer's results to mean that the child makes no distinctions of color till the end of the second year, and that 'Red' is distinguished before 'Blue.'

Preyer himself says, in the English translation of his work known as the *Infant Mind*, "I put color tests to my child for a series of years. Before he could talk, he was unable to distinguish Green and Blue as surely as Red and Yellow, and White and Black; and he confounded Green and Blue with Gray, and at a later period he confounded their names."

Binet's results differed from Preyer's; he believed Blue was the first color perceived, but, like Preyer, he experimented on one child only. Binet's experiments, related in the *Revue Philosophique* XXX, p. 583, also depended upon the connection between color and name having been established.

In both cases, however, that of Preyer and that of Binet,<sup>1</sup> there appears to have been a direct inference from a knowledge of the name and the order in which that name was acquired to the order in which the color was perceived.

Professor Mark Baldwin, in his *Mental Development in the Child and in the Race*, page 53, quite rightly criticised the assumption underlying the above arguments, and experimented with one of his children, beginning at the ninth month. He used a method, in which names were not employed, which he called the 'dynamogenic' method. He presented colored papers

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<sup>1</sup>I am quite sure, though I cannot find the reference, that later work by Binet makes a clear distinction between the order of perceiving and that of naming.

at different distances, and noticed to which and how much the child moved to get them. He found the order of attractiveness to be Blue, White, Red, Green. Unfortunately, however, the order of attractiveness need not be the order of perception; it is fairly certain from general psychological considerations that it is not; for we know that what is quite well known loses attractiveness, after a time, from the mere fact that it is well known.

Perhaps we may pause for a moment to express surprise, if not consternation, that our search for the order of color development has so far brought us difficulty after difficulty. We see that the problem has occupied the minds of very able men; yet little agreement, if any, can be found so far.

There is, I think, a general biologic consideration which, had it been present in the minds of those who have argued trenchantly on these facts derived from individual cases, might have saved much logomachy. Ought we to have expected exact uniformity in the development of these children? The presence of the sensory basis of color sensation—whatever that may be—is only one element or factor necessary in the perception of color. One must have exactly similar and constant environments for all observers before one can conclude that the variations found in perception are due to differences in the sensory basis. And even then why should the development of the sensory basis in every individual be quite the same even under exactly similar environments?

We must, I think, be content with something much less definite than early experimenters thought possible—the true result, perhaps, will be a kind of mean from a number of developments which are not quite the same. But I am afraid I am going ahead a little too fast; I am not aware that, up to the present, my reader will think that a case has been made out for any order of development at all; he is more likely to say, having regard to the variety of different orders so far thrust upon his notice, “A plague upon all your orders.”

But I must not leave this section of the subject without a reference to the work of Garbini, *Evoluzione del senso cromatica nei bambini*. Arch. per l'Antropologia XXIV. I regret to say that I have been unable to see the original paper; but I am glad to be able to express my acknowledgments of gratitude to the succinct account of it given in Dr. A. F. Chamberlain's valuable compendium, *The Child*.

Garbini employed a name method and a matching method without names, and compared the orders of the two developments—of the order in which the colors were most accurately matched and of the order in which, later in the child's life,

they were most accurately named. He experimented with about 550 children, boys and girls, between the ages of three and six; so that, with his work, we have no feeling of insecurity from the paucity of the cases. Garbini found that the order of perception was identical with the order of naming, and that this order was Red, Green, Yellow, Orange, Blue, Violet. Perhaps it may be found useful subsequently, if I give the Italian names—rosso, verde, giallo, arancio, blu, violetto.

These results are of great importance. We have (1) the fact of the development of the color sense, (2) the order in which the colors become perceptible, (3) the fact of development in color nomenclature, (4) the order in which the names of the colors become known, and (5) the exact correspondence between these two orders of development—all these important questions dealt with and settled in a way which appears, on the face of it, certainly coherent and extremely probable.

And there is very marked resemblance between the results of the work with Garbini's children, the conclusions drawn from the philological consideration of ancient language, and the results of Dr. Rivers's work both philological and experimental.

The anthropologic order, so to speak, is White—Black; Red; Yellow; Green; Blue.

Garbini's paidological order is White—Black; Red; Green; Yellow; Blue.

Garbini concluded that the child begins to see Red and Green towards the end of his second year; and that, during his third year, he begins to discern Yellow, and has the first impression of Orange, Blue and Violet; but only begins, for, from thence onwards until the sixth year and even later, the child only becomes adequately familiar with Orange, Blue and Violet.

There is no doubt that the work on children, so far, had led to the conclusion that the color sense was absent until the period just before the close of the second year, and that its growth was somewhat slow. But it was not doubted that lightness and darkness, whiteness, grayness and blackness were perceptible much earlier; and that objects were discriminated by means of their varying brightnesses before their different colors, as such, assisted the child to distinguish them in any way.

I wish now to refer again to an interesting piece of work by Dr. Holden and Mr. Bosse of New York. The paper may be found in full in the *Archives of Ophthalmology*, Vol. XXIX, No. 2, 1900. They pointed out, truly enough, that a child might reach to a colored object because of its difference in brightness from its background, even when no color could be

seen at all. One might, perhaps, go further and say that a child *might* successfully *match* a number of colored objects, putting all the reds with the reds, all the blues with the blues, and so on, simply because the reds and blues were unequal in point of luminosity.

The importance of this consideration is decidedly great, and it would certainly seem that if, by placing the colors on backgrounds of equal luminosity with themselves, we took away one means of discrimination—admittedly possessed by quite young children—and forced the child to discriminate by means of his color vision alone, we should discover that *the sensibility to color, as distinct from that to brightness, was a very much later development than had previously been supposed.*

Dr. Holden and Mr. Bosse aimed at eliminating this element of luminosity altogether; and found, by their method, that the development of color sensibility was *much earlier* than had previously been supposed. The child had now less to go by, but he discriminated better—a certainly unexpected conclusion. Is it allowable to suggest that, after all, Garbini's children were Italians, and these little ones were among the brightest and least shy inmates of the New York Nurseries?

Perhaps a word or two may be admissible as to the nature of the test. A small square of colored paper was placed on a gray of equal luminosity. "If the young child made an effort to grasp the colored square it must have perceived *that color*," say the authors. Well, I suppose we all grant that the infant did not try to pick up a piece of colored paper which he could not see; but he might see it and not grasp for it, one would think; this, indeed, is allowed by the authors, who say that the failure to reach out for the green, blue and violet might have been in part due to lack of interest in them, though they think that the perception of colors of the red end of the spectrum is acquired a little earlier than of those of shorter wave length. All these colors are seen and reached for within the first year. The method hardly allows the statement of a definite order of perception, but it seems apparent that Red, Orange, Yellow were visible quite early; Green, Blue, Violet were perceived later, though, in some cases, no evidence could be obtained that Blue was perceptible at all.

All this interesting work goes in a general way to support the anthropological view before quoted; but there are some interesting differences between these results and those of Garbini.

Dr. Holden and Mr. Bosse assert that average infants of seven or eight months old promptly react to Red, Orange and Yellow; and that, with infants of ten to twelve months of age, there was prompt reaction to Green, Blue and Violet as well.

Garbini thinks that the first chromatic perceptions occur between the sixteenth and twenty-fourth month; that these first color perceptions are Red and Green; that the child begins to differentiate Yellow during the third year, and then Orange, Blue and Violet in the order named.

The problem may be put thus: Does the child become aware of colors in the spectral order beginning from the red end, or does he find certain non-adjacent portions of the spectrum more distinct as colors at first, and perceive the intermediate and gradation colors afterwards? I put the case in this way merely as an illustration and not because I wish to insinuate that spectral order has necessarily anything to do with the question of the order of color perception in human beings. With all deference to physicists I am strongly of opinion that the construction of a psychological theory of color-development which will stand has not been much advanced by constant reference to physical problems.

Perhaps it may be suggested at this point that, so far, neither of the great color-theories have received much encouragement. It is not unfair to suppose that the so-called primary color substances would have been developed first. Now Garbini's results do seem intelligible on the Hering theory, but the Holden-Bosse results seem hard to understand on either the Young-Helmholtz or the Hering theory, which, by the way, is also the case with what we might call the anthropological order of development.

But—I am afraid there is a but—is the inference, on which Dr. Holden's results are based, sound? May we say, when the child reaches for the red, orange, yellow, green or blue paper that it must have perceived *that* color? It seems to me we should only be justified in saying so if he could distinguish these colors from each other. *Must have perceived color* would perhaps have been a fairer conclusion. This consideration may solve the awkward question as to the great difference in the ages at which American and Italian children appear to perceive the colors. Garbini's children were required to discriminate one color from another; the American children were required only to perceive color, not colors.

It is not uncommon for young children to apply with avidity the same color name to all colors; sometimes that name is Red, sometimes it is Blue, and sometimes it is Color. Now, if we are justified in believing that there is some kind of parallelism between the development of the nomenclature and the development of the sensibility—and, if we accept the results of Garbini with children and Dr. Rivers with primitive peoples, we must so believe—I should like to go a step further than has been done so far. I should like to suggest not only,

as has been said, that the order in which the names are learned is the order in which the sensibilities for the various colors are developed, but that the application of one or two names to all colors is an indication that before Red, Green, Blue and the rest are seen as colors, all these things are seen as color, and at an early stage are neither Red, Green, Blue, Yellow, nor any other sensation with which adults are acquainted, but a unitary sensation out of which certain components become more and more definite as time goes on, and more and more unlike each other; when this latter stage begins we have the perception of colors; it is this stage only which we can speak of as that of color development.

But at this point I shall be told and quite rightly, I fear, that the correlation between sensibility and language is much too doubtful to support such a superstructure of hypothesis. Arguments can be advanced on both sides; on the side of correlation it can be urged

1. That we adults ask names for new thoughts, new things and new sensations when we apprehend them, and that much more is this the case with children.

2. That the objective tests of Dr. Rivers and Garbini, coupled with name tests, exhibit certain correspondences, with Garbini a correspondence of orders of development, with Dr. Rivers a correspondence between a high threshold of perception and defective nomenclature.

An opponent could plead: firstly, that we can perceive plenty of things for which we have no names, that we do not ask names merely because we perceive things but because we are interested in them, and especially that we can see many colors for which we have no names. Mr. Hoopdriver, in Mr. H. G. Wells's *Wheels of Chance*, when for the first time he saw the flowers of the country side, marvelled that they had no names: one cannot pretend that he did not see them because he did not know their names. Secondly, that cases are on evidence, for example, the Nubians examined by Virchow, in which defective language was not accompanied by defective sensibility. Thirdly, that if these persons whose terminology for color is defective are given instruction as to the separate and several names, their color names will be found as accurate as our own, at least, in a little while, for one could hardly expect the names to be acquired without some misplacement of terms at first.

How can we overcome this difficulty as to language? It seems to me that we must find cases *in which certain color names have an equal chance of being known*, so far as instruction is concerned. Then, if some names are found to be known better than others, this may arise from two causes:



1. Because the name is easier to articulate and remember: "yellow," for example, is a hard color-name, "red" is an easy one.

2. Because the sensibility to the color is better developed; for we could hardly expect a child to learn the color name of a color which he can barely discriminate, if at all.

There is a critical consideration sometimes advanced which needs mention. It is urged that the child may discriminate all the spectral colors from one another at a very early age, but that he does not learn the names of all the colors which he can discriminate, but only of those by which he is attracted. In finding the order in which the names become known, one is therefore only finding an order of attractiveness, not an order of perception. This consideration appears to me to be a weighty one; and, were the child left to pick up his color names from information which he gets at home about colors which interest him personally, I should attach great importance to it. But the children, whose color names I ask the reader to consider in this paper, are children who learn these things at school. And the important points in this connection are that, in the infant schools which these children attend, colored objects are in use—worsted balls and beads—which are of fairly constant coloration in all schools; and that, of these things, the teachers do not, on the whole, teach the name of one color more frequently than another. If the child can easily discriminate the color, can easily articulate and remember the name, and can connect the name with the color, there is reason to suppose, on the methods of teaching employed, that he would learn the name for every color used, and not merely for those for which he felt a liking.

To me, therefore, it seemed that the conditions were especially favorable for a test with color names, and that we might, under these conditions, draw some inferences from the order of naming to the order of perception. The exercises were two in number:

1. The colored worsted balls of the Froebelian Gift 1 were arranged in the following order: Red, Orange, Yellow, Green, Blue, Violet. Each child was asked separately to name the colors. In some cases the colors were presented in the reverse order.

2. Strings of large glass beads in use in the school, the coloration and luminosity of which differed markedly from those of the worsted balls of corresponding colors, were arranged in the following order: White, Black, Red, \*Amber,

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\*NOTE. The Amber beads were a transparent brownish yellow. It was not to be expected that young children would call them yellow.

TABLE IA  
Showing the Color-Names of School "A"

Name	Sex	Age		First Exercise							Second Exercise				
		yrs.	ms.	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
Initial only															
S. F.		3	3	Black	Black	—	Black	Red	Red	Black	Black	Black	Black	Red	Red
V. G.		3	3	White	—	Yellow-Red	Red	Blue	Yellow	Blue	Red	Red	Red	Red	Red
A. T.		3	3	Black	Black	Black	Red	Black	Black	Red	Black	Red	Black	Red	Red
B. C.		3	3	—	—	—	—	Blue	Blue	Blue	—	Blue	White	—	Blue
F. P.		3	4	Blue	—	Red	Red	Blue	Blue	Blue	Black	Red	Blue	Blue	Red
D. M.		3	11	Red	Red	—	—	—	—	—	Black	Red	—	—	—
C. J.		4	2	Red	Blue	Yellow	Green	Violet	Violet	White	Black	Red	Black	Yellow	Blue
M. P.		4	5	Red	Blue	Red	Dark	Red	Blue	White	Black	White	Blue	Blue	Blue
E. P.		4	6	Red	Pale Yellow	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
E. W.		4	7	Red	Dark Yellow	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
E. T.		4	7	Red	—	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue
L. D.		4	10	Red	Yellow	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
N. B.		4	11	Red	Blue	Green	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue

NOTES. 1. When two color-names occur, separated by a hyphen, both names were applied in the order in which they were written.

2. The blank spaces mean that no answer was given. I should have been inclined to regard these blanks as better than errors, had it not been apparent that the older children, even when ignorant of the name which we apply, were almost invariably ready with some name which to them seemed applicable.

3. I regret that I am unable to give the sex of the children in this table.

Green, Blue. In some cases the colors were presented in the reverse order. Each child was asked separately to name the colors. No child proceeded immediately from Exercise 1 to Exercise 2. All the children tested in the same school attempted Exercise 1 first, and then, after a short interval, attempted Exercise 2.

Perhaps a few comments directly attached to the Table may make my subsequent argument clearer.

In the first group of children—whose ages are between 3 and 4—we find only a few color names in use, and these are used with what seems to us an absolute lack of discrimination. It may subsequently prove of importance if we set down in order the number of times each name is used; but, before doing so, it is worth noting that, of these six children, three—S. F., A. T., and D. M.—had *two* color names only, Red and Black. B. C. had two names only, Blue and White. F. P. had three names only, Red, Black and Blue. V. G. had four only, Red, Yellow, Blue and White.

TABLE I B

*Showing the number of times each Color-Name was used in School "A"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
* Black	16 times	9 times	25 times
White	2 "	8 "	10 "
Red	22 "	15 "	37 "
Blue	13 "	18 "	31 "
Green	0 "	12 "	12 "
Yellow	2 "	12 "	14 "
Orange	0 "	0 "	0 "
Violet	0 "	7 "	7 "
Brown	0 "	2 "	2 "

\* NOTE 1. I have included in this number the word "Dark" which was once given for "Green." The word "Black" is unusually prominent in this school. Can this be connected with the fact that the only social events of general interest in this immediate neighborhood are funerals?

NOTE 2. It will be remembered, in considering the figures of Tables marked B, that there were no Blacks and Whites among the worsted balls.

The next school at which the observations were made, School "S", was socially on a level with School 'A'; but its environment was, if anything, more colorless, and without the spice of excitement and the visual stimulation of moving things provided in the former case by proximity to a main road.

TABLE I C

*Showing the percentage of Color-Names correctly used in School "A"*

Color-Names	Ages 3-4		Ages 4-5	
	Times used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	4 out of 6	67	7 out of 7	100
White	0 " " 6	0	7 " " 7	100
Red	5 " " 12	42	13 " " 14	93
Blue	4 " " 12	33	12 " " 14	86
Green	0 " " 12	0	11 " " 14	79
Yellow	1 " " 6	17	5 " " 7	71
Orange	0 " " 6	0	0 " " 7	0
Violet	0 " " 6	0	6 " " 7	86

In the first group of children, ranging in age from 3 years 1 month to 3 years 10 months, we find one child who insists on responding to our questions about the names of colors, by the word 'Color,' varying it only in one case, in which she says 'Another Color.' E. S. somewhat resembles J. K.; she used the word 'Color' twice; in all other cases she used the name 'Black.' F. M., after starting well, lapsed into a color terminology of her own. 'Blue' she called 'E,' in both exercises, though they were very different Blues, and 'Green' she called 'Air,' though they were very different Greens. Three other children fall back on the word 'Color,' or 'Color-one'—F. K., V. C. and H. B. And in the second group of children—those varying from 4 years 2 months to 4 years 9 months—the oldest child is found using the word 'color' not less than three times. The theoretical interest lies in this: We have to ask ourselves how far we are justified in supposing that the word 'color', when used by a young child, represents a concept embracing different units previously discriminated as red, blue, etc.; or whether, prior to this discrimination, 'color' does not mean for him a unitary apprehension. Then the parts of the continuum which stand out earliest will, other conditions being equal, get their names first. This, at least, is a possible explanation of the very early use of the word 'color.' And it is fairly obvious that, on association principles, the word would appear much later; it would need to be generalized from its instances.

The next school at which the observations were taken was in a neighborhood decidedly superior to those of the two previous schools, and the school was very full. It was not easy, therefore, to obtain very young children—the youngest I could get was 3 years 5 months old; and I could only find four

TABLE II A  
Showing the Color-Names of School "S"

Name	Sex	Age		First Exercise						Second Exercise					
		yrs.	ms.		Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
F. K.	B	3	1	Red	Red	Yellow	Green	Blue	Blue	White	Color	Red	Blue	Blue	Blue
V. C.	B	3	2	White	Color-one	White	Green	Red	Red	White	White	White	White	White	Blue
E. S.	G	3	5	Black	Black	Black	Color	Black	Color	Black	Black	Black	—	Black	Black
J. K.	G	3	9	Color	Color	Color	Color	Color	Another Color	Color	Color	Color	Color	Color	Color
F. M.	G	3	9	Red	Yellow	Orange	Air	E	Air	Air	E	Air	E	Air	E
H. B.	B	3	10	White	—	—	—	Blue	Blue	—	—	Yellow	—	—	Color
M. McD.	G	3	10	Red	Yellow	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Yellow	Blue
E. J.	G	4	2	Red	Brown	Brown	Green	Blue	Violet	White	Color	Red	Green-Brown	Green	Green
W. B.	B	4	6	Red	Brown	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue
R. H.	B	4	7	Red	Green	Yellow	Green	Blue	Blue	White	Black	Green	Yellow-Green	Green	Blue
M. M.	G	4	8	Red	Yellow	Yellow	Green	Blue	Blue	White	Black	Red	Brown	Green	Blue
W. M.	B	4	9	Blue	White	Color	Green	Blue	Color	White	White	Green	Blue	Color	Blue

TABLE II B

*Showing the number of times each Color-Name was used  
in School "S"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	10 times	3 times	13 times
White	10 "	7 "	17 "
Red	8 "	7 "	15 "
Blue	10 "	13 "	23 "
Green	3 "	15 "	18 "
Yellow	6 "	5 "	11 "
Orange	1 "	0 "	1 "
Violet	1 "	2 "	3 "
Brown	1 "	5 "	6 "

TABLE II C

*Showing the Percentage of Color-Names Correctly used in School "S"*

Color-Names	Ages 3-4		Ages 4-5	
	Times Correctly used	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	2 out of 7	29	3 out of 5	60
White	3 " " 7	43	5 " " 5	100
Red	5 " " 14	36	7 " " 10	70
Blue	6 " " 14	43	9 " " 10	90
Green	3 " " 14	21	9 " " 10	90
Yellow	2 " " 7	29	3 " " 5	60
Orange	0 " " 7	0	0 " " 5	0
Violet	1 " " 7	14	2 " " 5	40

children then present under 4 years of age: I was, however, able to get an adequate sample of children between 4 and 5.

We note at once an increase in the number of color-names. One child, K. S., on one occasion only, falls back on the word 'Color,' and only one child, D. S., has as few as two color-names. She, it will be noted, used 'Red' and 'White' only. All the other children have at least four names, though they are not, of course, always accurately applied.

The next school at which the observations were made was in a poor neighborhood with a colorless and cheerless environment, though not very far removed from the bustle and movement of a great thoroughfare.

One child, A. N., applied the name 'Blue' to every color indiscriminately; this was perhaps in her language equivalent to the word 'Color.' The latter word was not used by any child in this school; but one child used the word 'grass' for the amber and the green beads in the second exercise. The names

TABLE III A

*Showing the Color-Names of School "G"*

Name	Sex	Age		First Exercise					Second Exercise						
		yrs.	ms.	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
Initials only															
D. S.	G	3	5	Red	Red	Red	White	White	Red	White	White	Red	White	Red	White
H. H.	G	3	5	Red	—	Yellow	Green	Red	Blue	White	Black	Red	Green	Yellow	Blue
K. S.	G	3	8	Red	White	White	Green	Color	Red	White	Black	Red	Red	Green	Red
M. S.	G	3	10	Blue	Blue	White	White	Blue	White	White	Black	Red	White	Blue	Red
E. G.	B	4	2	Red	Yellow	—	Green	Blue	Blue	White	—	Red	Yellow	Green	Blue
G. G.	B	4	4	Red	Brown	Blue	Blue	Blue	Blue	White	Black	Red	Brown	Blue	Blue
E. M.	G	4	5	Red	Orange	Green <sup>(1)</sup> Yellow <sup>(2)</sup>	Green	Blue	Blue	White	Black	Red	Yellow	Green	Blue
K. B.	G	4	6	Red	—	—	Red	Red	Red	White	Black	Pink	Red	Red	Red
V. G.	B	4	6	Red	Yellow	Yellow	Red	Blue	Blue	White	Blue	Red	Yellow	Red	Blue
W. B.	B	4	9	Red	Orange	Yellow	Green	Blue	Blue	White	Black	Red	Yellow	Green	Blue
A. H.	G	4	10	Red	Yellow	Yellow	Green	Blue	Blue	White	Black	Red	Yellow	Green	Blue

TABLE III B

*Showing the number of times each Color-Name was used in School "G"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	3 times	5 times	8 times
White	14 "	7 "	21 "
Red	17 "	21 "	38 "
Blue	6 "	22 "	28 "
Green	4 "	9 "	13 "
Yellow	2 "	12 "	14 "
Orange	0 "	2 "	2 "
Violet	0 "	0 "	0 "
Brown	0 "	2 "	2 "

TABLE III C

*Showing the Percentage of Color-Names correctly used in School "G"*

Color-Names	Ages 3-4		Ages 4-5	
	Times used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	3 out of 4	75	5 out of 7	71
White	3 " " 4	75	7 " " 7	100
Red	7 " " 8	87	13 " " 14	93
Blue	2 " " 8	25	12 " " 14	86
Green	3 " " 8	37	8 " " 14	57
Yellow	1 " " 4	25	4 " " 7	57
Orange	0 " " 4	0	2 " " 7	29
Violet	0 " " 4	0	0 " " 7	0

are generally more developed among these children, though one boy, G. C., has three names only—Red, White Black.

The school at which similar observations were next taken was situated in a better neighborhood, and stood beside a park. The word Green is, undoubtedly, a more prominent feature than usual in the vocabulary of these children, though the average age of both groups, namely that consisting of children from 3 to 4 years of age, and that of children from 4 to 5, is low.

At the commencement of the table given above, we are fortunate in having five very young children, one of whom, C. M., has one color-name only—'Red,' which she applies to *all* colors; it is her word for color. G. B. has two color-names only, 'Blue' and 'Dark.' T. F. has three only, 'Green,' 'Black,' 'White.' S. L. and W. H. have three names only, 'Red,' 'Green,' 'White.' E. H., who is several months older, has three names only, 'Red,' 'Black' and 'Green.' The great



TABLE IV A

*Showing the Color-Names of School "R"*

Name	Age		First Exercise					Second Exercise						
	Sex	yrs. ms.	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
Initials only														
A. N.	G	3	1	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
G. C.	G	3	3	Red	White	Red	White	Red	White	Black	Red	White	Green	White
G. C.	B	3	5	Red	White	Red	White	White	White	Black	White	Red	White	White
B. B.	B	3	8	Yellow	—	—	—	Blue	White	Black	Red	Grass	Grass	Blue
M. H.	G	3	8	Blue	White	Blue	White	Blue	White	Black	Black	White	Black	Blue
J. C.	G	3	8	Red	Yellow	Green	Blue	Blue	White	Black	Black	Green	Green	Blue
A. P.	G	3	11	Black	White	Green	White	Violet	Green	Black	—	—	Green	Blue
E. N.	G	4	3	Red	—	Green	Blue	Blue	White	Black	Red	—	Green	Blue
C. B.	B	4	3	Red	White	Blue	Red	Green	White	Blue	Red	—	Gay	—
B. C.	B	4	5	Red	Yellow	Green	Blue	Blue	White	Black	Red	Brown	Green	Blue
F. B.	G	4	7	Red	Yellow	Green	Blue	Blue	White	Black	Red	—	Green	Blue
L. W.	G	4	11	Red	Yellow	Green	Blue	Blue	White	Black	Red	Brown	Green	Blue
M. C.	G	4	11	Red	Brown	Blue	Blue	Blue	White	Black	Red	Yellow	Blue	Blue

TABLE IV B

*Showing the number of Times each Color-Name was used in School "R"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	10 times	5 times	15 times
White	21 "	9 "	30 "
Red	10 "	13 "	23 "
Blue	23 "	19 "	42 "
Green	7 "	9 "	16 "
Yellow	4 "	7 "	11 "
Orange	0 "	0 "	0 "
Violet	1 "	0 "	1 "
Brown	0 "	3 "	3 "

TABLE IV C

*Showing the Percentage of Color-Names correctly used in School "R"*

Color-Names	Ages 3-4		Ages 4-5	
	Times used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	6 out of 7	86	5 out of 6	83
White	5 " " 7	71	6 " " 6	100
Red	5 " " 14	36	12 " " 12	100
Blue	8 " " 14	57	10 " " 12	83
Green	5 " " 14	36	8 " " 12	67
Yellow	2 " " 7	29	3 " " 6	50
Orange	0 " " 7	0	0 " " 6	0
Violet	1 " " 7	14	0 " " 6	0

feature of interest in this table is the very early appearance of 'Green.' It is noteworthy that the elder group were much better acquainted than usual with names like 'Violet,' 'Orange,' 'Brown,' so that the earlier appearance of 'Green' may not be due to environment, as I suggested in a previous similar case, but to the slightly superior social class of the children.

The school in which the next observations were made is situated in a somewhat poor district ; but one in which the small house and long garden, once characteristic of London's poorer suburbs, have not been entirely swept away by modern improvements!

The two youngest children, C. N. and W. N., were very deficient in color names, as was L. P., who was six months older—an important difference at this age, so far as the acquisition of language is concerned. L. P. is another case to be added to those which we have already found, in which the

TABLE V A  
Showing the Color-Names of School "P"

Name	Sex	Age		First Exercise					Second Exercise						
		yrs.	ms.	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
G. B.	B	3	0	Blue	Blue	Blue	Dark Green	Blue	Dark White	Blue	Blue	Blue	Dark	Blue	Blue
T. F.	G	3	1	White	—	—	Green	White	White	White	White	White	White	Green	White
S. L.	B	3	1	Red	White	Green	Green	—	Red	—	Red	—	Red	White	White
W. H.	B	3	2	Green	Red	Red	Red	Green	Green	White	Red	White	White	White	Green
C. M.	G	3	2	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
E. H.	B	3	6	Red	Green	Green	Red	—	Red	—	Black	Red	—	Red	Red
T. B.	B	3	7	Red	Red	Like butter	Green	Blue	Blue	White	Black	—	Green	Green	Blue
C. M.	G	3	7	Red	Yellow	—	Green	Blue	Blue	—	Black	Red	—	—	Blue
L. B.	G	4	3	Red	Orange	White	Green	Blue	Blue	White	Black	Red	Brown	Green	Blue
H. O.	B	4	3	Red	Yellow	—	Green	Blue	Violet	White	Black	Red	—	Green	Blue
A. C.	B	4	6	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue
N. H.	G	4	7	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue
C. M.	B	4	8	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Brown	Green	Blue
A. H.	B	4	8	Red	—	White	Green	Blue	Blue	White	Black	Red	Green	Green	Blue

TABLE V B

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	4 times	6 times	10 times
White	16 "	8 "	24 "
Red	30 "	12 "	42 "
Blue	15 "	14 "	29 "
Green	14 "	13 "	27 "
Yellow	1 "	4 "	5 "
Orange	0 "	4 "	4 "
Violet	0 "	4 "	4 "
Brown	0 "	4 "	4 "

TABLE V C

*Showing the Percentage of Color-Names correctly used in School "P"*

Color-Names	Ages 3-4		Ages 4-5	
	Times used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	4 out of 8	50	6 out of 6	100
White	3 " " 8	37	6 " " 6	100
Red	8 " " 16	50	12 " " 12	100
Blue	6 " " 16	37	12 " " 12	100
Green	6 " " 16	37	12 " " 12	100
Yellow	0 " " 8	0	3 " " 6	50
Orange	0 " " 8	0	4 " " 6	67
Violet	0 " " 8	0	4 " " 6	67

word 'Red' is the generic color-name; C. N. has the word 'White' as well. W. N., though tried in a variety of ways, beyond those specified in the exercises, was not found to be the possessor of any color-name at all; he spoke quite freely but used no color words which his teachers or I could recognize or even see any constancy in as applied to colors.

The most striking feature in this table is the complete absence of the word 'Blue' in the younger group, and its infrequency as compared with 'Green' in both groups. These facts should be noted since they are, I think, quite exceptional as far as these tables are concerned.

The next observations presented were made at a school situated in a decidedly better neighborhood than the two preceding ones. It stands facing a large open space with many trees, much grass, and some flowers.

From one child, T. W., we failed altogether to elicit any words which appeared to have reference to color; but generally speaking there was decided superiority in color vocabulary in this school. 'Green,' again, as in the previous case in

TABLE VI A  
Showing the Color-Names of School "C"

Name		Age		First Exercise					Second Exercise						
Initial only	Sex	yrs.	ms.	Red	Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green	Blue
C. N.	B	3	1	White	White	White	White	—	—	Red	Red	Red	—	White	White
W. N.	B	3	1	—	—	—	—	—	—	—	—	—	—	—	—
L. P.	G	3	7	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
B. H.	G	3	8	Red	White	—	Green	Red	Red	White	Black	Red	White	Green	Red
L. S.	G	4	0	Red	—	Blue	Green	White	—	White	Red	Red	—	Green	—
J. P.	G	4	8	Red	Brown	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
T. A.	B	4	8	Red	Violet	—	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
N. S.	G	4	9	Red	Violet	Yellow	Green	Blue	Violet	White	Black	Red	Violet	Blue	Violet
W. N.	B	4	10	Red	—	Yellow	Green	Violet	Violet	White	Black	Red	Yellow	Green	Blue

TABLE VI B

*Showing the number of times each Color-Name was used in School "C"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	1 time	4 times	5 times
White	10 times	4 "	14 "
Red	24 "	8 "	32 "
Blue	1 "	7 "	8 "
Green	4 "	7 "	11 "
Yellow	0 "	6 "	6 "
Orange	0 "	0 "	0 "
Violet	0 "	9 "	9 "
Brown	0 "	1 "	1 "

TABLE VI C

*Showing the Percentage of Color-Names correctly used in School "C"*

Color-Names	Ages 3-4		Ages 4-5	
	Times used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	1 out of 5	20	4 out of 4	100
White	1 " " 5	20	4 " " 4	100
Red	7 " " 10	70	8 " " 8	100
Blue	0 " " 10	0	6 " " 8	75
Green	4 " " 10	40	7 " " 8	87
Yellow	0 " " 5	0	3 " " 4	75
Orange	0 " " 5	0	0 " " 4	0
Violet	0 " " 5	0	4 " " 4	100

which the school fronted a park, was better known than usual. Only one other child, H. T., had less than four color-names, and he had 'White,' 'Black' and 'Red.'

It is impossible to read the foregoing tables without coming to the conclusion that, both in the younger and older groups, there is much agreement as to the order of the accuracy with which the color-names are applied. The names Black, White and Red are used with approximately equal accuracy by both these groups of children who, as I have said, have been taught equally to name all these colors. There can, too, I think, be little doubt that Blue occupies the next place in order of accuracy, that Green follows Blue, and is, in its turn, followed by Yellow, whilst Violet and Orange are quite at the bottom of the list.

It must not be supposed, however, that we are quite sure that every *one* of these children had been taught exactly equally every *one* of these color-names. The three-year-old group in school

TABLE VII A  
*Showing the Color-Names of School "D"*

Name	Sex	yrs.	ms.	Age	First Exercise					Second Exercise				
					Orange	Yellow	Green	Blue	Violet	White	Black	Red	Amber	Green
T. S.	B	3	1	White	White	Green	White	White	White	Black	Green	White	Red	Green
T. W.	B	3	2	—	—	—	—	—	—	—	—	—	—	—
C. H.	B	3	3	Yellow	—	Green	Blue	Blue	White	Black	Red	Green	—	—
H. T.	B	3	6	White	Red	Red	Red	Red	White	Black	White	Red	Red	Red
E. H.	G	3	8	Red	—	Green	—	—	White	Black	Red	—	Green	Blue
D. P.	G	3	8	—	Yellow	Green	Blue	Violet	White	Black	Red	—	Red	Blue
L. P.*†	B	3	7	Red	—	Red	Pink	Red	Blue	Dirty- Blue	—	Blue	Beads of White	Blue
L. S.*	B	3	7	Red	Yellow- Red	Blue	Blue	Blue	Wash	Blown	Red	Red	Green	Blue
E. H.*	B	3	7	Green	White	Green	White	Green	White	Black	Green	Green	Green	Blue
A. D.*	B	3	8	Red	White	Red	Blue	Color	White	Black	Blue	Color	Blue	Blue
T. E.	B	4	0	Red	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
M. F.	B	4	2	Red	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
T. W.	G	4	4	Red	Yellow	Green	Blue	Violet	White	Black	Red	Yellow	Green	Blue
M. B.	G	4	5	Red	Orange	Green	Blue	Blue	White	Black	Red	Yellow	Green	Blue
R. D.	B	4	7	Red	Yellow	—	Green	Violet	White	Black	Red	Yellow	Green	Blue
W. W.	G	4	8	Red	Orange	Green	Yellow	Orange	White	Red	Red	Yellow	Green	Blue

\* In these four cases the balls and beads were presented in the reverse of the usual order.

† L. P. volunteered the information that the blue beads were like the red beads.

TABLE VII B

*Showing the number of times each Color-Name was used in School "D"*

Color-Names	Ages 3-4	Ages 4-5	All Ages
Black	7 times	5 times	12 times
White	19 "	6 "	25 "
Red	25 "	13 "	38 "
Blue	19 "	11 "	30 "
Green	17 "	13 "	30 "
Yellow	3 "	13 "	16 "
Orange	0 "	6 "	6 "
Violet	1 "	4 "	5 "
Brown	1 "	0 "	1 "

TABLE VII C

*Showing the Percentage of Color-Names Correctly used in School "D"*

Color-Names	Ages 3-4		Ages 4-5	
	Names used Correctly	Percentage of Correct Ans.	Times used Correctly	Percentage of Correct Ans.
Black	7 out of 10	70	5 out of 6	83
White	7 " " 10	70	6 " " 6	100
Red	8 " " 20	40	12 " " 12	100
Blue	10 " " 20	50	10 " " 12	83
Green	8 " " 20	40	11 " " 12	92
Yellow	2 " " 10	20	5 " " 6	83
Orange	0 " " 10	0	5 " " 6	83
Violet	1 " " 10	10	4 " " 6	67

TABLE VIII

*Summary, Showing the Percentage of Color-Names Correctly used in all Schools.*

Color-Names	Ages 3-4								Ages 4-5							
	School	School	School	School	School	School	School	Average	School	School	School	School	School	School	School	Average
	A	S	G	R	P	C	D		A	S	G	R	P	C	D	
Black	67	29	75	86	50	20	70	57	100	60	71	83	100	100	83	85
White	0	43	75	71	37	20	70	45	100	100	100	100	100	100	100	100
Red	42	36	87	36	50	70	40	52	93	70	93	100	100	100	100	94
Blue	33	43	25	57	37	0	50	35	86	90	86	83	100	75	83	86
Green	0	21	37	36	37	40	40	30	79	90	57	67	100	87	92	82
Yellow	17	29	25	29	0	0	20	17	71	60	57	50	50	75	83	64
Orange	0	0	0	0	0	0	0	0	0	0	29	0	67	0	83	26
Violet	0	14	0	14	0	0	10	5	86	40	0	0	67	100	67	51



'C,' for example, had done no previous work with the beads ; hence, probably, their low mark for Black and White, for there were *no* blacks or whites among the worsted balls ; and in the case of Blue, half at least of the chances of correct naming were absent also. I am quite unable to explain why, in the three-year-old group in School 'A,' the names White and Green should not have been accurately applied even once, for it is quite certain that the green ball of the Froebelian Gifts had been used. But, despite some anomalies, we may lay claim, on the whole, to have made out the order of accuracy with which the names are applied; and when we remember that there are neither black nor white balls in the Froebelian Gift 1, with which most of the early teaching of color is done, we shall probably accept the order of the correct application of color-names as

Black — White : Red : Blue : Green : Yellow : Violet : Orange.

But is it supposed that we are able from this order to infer a similar order in the development of the child's sensibilities to various colors? Let us deal for a moment with what is *not* asserted. It is *not* asserted that because a child cannot apply the word White correctly that he has no sensibility to White. It is *not* asserted that because a child says Red when looking at Green that we therefrom may infer that the child sees no difference whatever between Red and Green. I have no doubt at all, both from my own observations and from the work of others, that the discrimination of colors is a much earlier thing than the correct naming of them. The naming follows the sensibility and it follows *longo intervallo*, let us agree on that. But is the order in which the names are acquired, *provided that the child has equal opportunities of learning them and connecting them with the appropriate colors*, an indication of the order in which the sensibility to the different colors was acquired or became developed?

Garbini maintained not only that it was, but that he had shown, by separate tests on sensibility and vocabulary, that, for Italian children, the two orders coincided. The color-names became known in the order :

Rosso, Verde, Giallo, Arancio, Blu, Violetto, and this is exactly the order, according to Garbini, in which, with younger children, the sensibilities to these various colors were developed.

If Garbini's order coincided with my own, I should doubtless feel additional confidence in our common opinion that the *name-order* may indicate a *sensation-order*. I do not *know* that Garbini's children had had, generally speaking, equal opportunities of becoming acquainted with all the names. If they

had, as is quite possible, we must conclude either, 1. That the Italian order of sensational development is different from our own; or, 2. That the difficulties of learning the Italian names do not correspond to the difficulties in learning our English color-names.

If the former proposition be true, it seems that we must each rely wholly on national researches, for it is hard to believe in an Italian order without believing also in a German order, and in a French order, and, perhaps, in an American order. Personally, I should find this variety of orders hard to accept; but my reader must decide for himself.

If the second proposition be true, we *might* get a satisfactory explanation of the difference found; but it hardly seems that Italians would find *giallo*, pronounced djah'loh, so much easier than our children find *yellow*, that with them yellow would become known third and with us sixth. Blue is not a particularly easy word for a young English child, yet 'blue' with us comes second, and with Italian children the corresponding word 'blu' is learnt fifth.<sup>1</sup>

Let us turn for a moment to corresponding work in German. I do not propose to give any detailed account of individual researches; but from the admirable and comprehensive summary given by Professor Meumann in his *Experimental Pedagogy*,<sup>2</sup> we learn that the order in which color-names become known to German children is as follows:

Weiss—Schwarz: Rot: Blau; Grün: Gelb: Violett-Orange.

*Now this is exactly the order in which the names become known to London children:* We are more inclined to doubt a specific Italian order after this, unless we can show that the difficulties in the German vocabulary coincide with the difficulties in our vocabulary, whereas the Italian articulatory difficulties do not. Obviously, however, we cannot show this. Our word Yellow is a hard one for our children, Gelb is easy for German children, yet Yellow is learnt sixth in both countries. The difficult German word is Grün. Any one who has ever heard German teachers laboriously, and somewhat unsuccessfully, teaching the pronunciation of words containing the modified 'u' will have a very present sense of the difficulty of the word Grün. On the other hand 'green' is for English children a word of moderate difficulty only—yet green is learnt fifth in both countries. Rot and Red are of similar difficulty: Blau and Blue, Weiss and White, Violett and Violet, Orange and Orange, are of similar difficulty; and it does not surprise us to

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<sup>1</sup> This argument fails if the children are taught the word 'azzurro' for 'blue.'

<sup>2</sup> Einführung in die Experimentelle Pädagogik, Vol. I, page 108.

see them occupy exactly similar positions in both countries. But in Schwarz, Grün and Gelb we have words by no means corresponding in difficulty of pronunciation to Black, Green and Yellow, and yet *the same color is named in the same order of accuracy in Germany and England.*

It certainly does appear that there is in operation here a common factor which is strong enough to overcome the difference in order which may have been produced by the differences in the difficulty of the names.

Perhaps, at this juncture, it might be well to refer to a criticism on the method which was urged by Professor Sully during a discussion on the Color Sense at a meeting of the Anthropological Society. The children, he urged, would not have had equal chances of learning the color-names, because some of them would be taught the names at home. I fear, however, that these Elementary School children would not, in scarcely any case, receive instruction in color naming at home. They might have, and probably had, picked up something from hearing the talk of the elder members of the family. But the vital point is that the color preferences<sup>1</sup> of their elder brothers and sisters and fathers and mothers, and hence the colors they would hear most about are not such as would lead to knowledge in the order White—Black: Red: Blue: Green: Yellow. I do not wish to exclude the home talk as an altogether irrelevant factor, but I incline *a priori* to the view that it is of little weight in this case, and from the results it is apparently not operative.

During the course of these observations I learnt much, both positively and negatively, from the experienced teachers who were kind enough to assist me. When they discovered that I was best pleased with the child who was *trying* to name rightly, but who could not yet succeed, and that the boy or girl who rattled them all off glibly did not arouse my interest, they began to look at the matter in an objective spirit (it is fair to the teachers to say that I was then an Inspector of Schools) and took much interest in the experiments. Several of them, who, during the first exercise, heard the children confidently applying the wrong names, said to me: "Oh, they don't know, and are just saying anything." I might have answered that they were not exactly saying *anything*, they were, in almost every case, confining themselves to color-names. That limitation, by itself, counted for something. And when we came to the second exercise and found the child consistent in error, as he often was, the teachers gave

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<sup>1</sup> Winch: Color Preferences of School Children. *British Journal of Psychology*, Dec., 1909.

up that explanation, especially as they saw that, both in luminosity and color, the beads of the second exercise differed much from the worsted balls of the first exercise.

Yet I am by no means indisposed to admit that some naming occurred which seemed guided by little else than an indefinite association between all color sensations and all known color names. Professor Preyer, in the *Infant Mind*, page 13, in my judgment, overworks this factor. He says, referring to the way in which children call colors by their wrong names:

"They know the words which name colors, and they have the sensations of color all right, but they do not know which words and colors belong together. They do not understand their own sensations of color." Let us hope the last sentence is a mistranslation, for it is irrelevant to the issue, if not misleading—do any of us *understand* our own sensations of color? Professor Preyer's explanation, which resembles, in another form, the teachers' explanation—that the children were just saying anything—admits of a simple verification. I urge that it is not wholly satisfactory.

If there are no connections between the names and the particular sensations, but only between color and color-names, of which *any of the latter may be given to any of the former until the right one is learnt*, then the errors made should be scattered over the colors equally. If 'Red' is not known rightly in connection with its name, it will be called Green, Blue, Yellow an equal number of times, or, at least, approximately so, provided the child can say these names and knows as, *ex-hypothesi*, he does, that they *are* color names. Let us see, by reference to our tables, how the errors are distributed. How many times, for example, is Red called Green, how many times is it called Yellow, and so on?

Red was named	White	13 times
" "	Black	8 "
" "	Blue	9 "
" "	Green	7 "
" "	Yellow	2 "
Blue was named	White	15 "
" "	Black	3 "
" "	Red	23 "
" "	Green	5 "
" "	Yellow	1 "
Green was named	White	9 "
" "	Black	3 "
" "	Red	26 "
" "	Blue	16 "
" "	Yellow	3 "

Yellow was named	White	28	“
“	“	“	Black
“	“	“	Red
“	“	“	Blue
“	“	“	Green
		10	“

As it was decidedly unfair to count the answers to the questions as to the color of the transparent brownish-yellow or amber beads as involving knowledge or ignorance of yellow, the number of answers given as to the color of the yellow worsted ball is doubled, so as to compare with those given for Red, Blue, and Green.

If any one of my readers cares to work out the distribution of these errors among the children of various ages and various schools, he will find that the totals are fairly representative of all the children, and are not mere haphazard totals. That being the case, we may safely draw the conclusion that some general tendencies are at work; there is not a chance distribution of error over all the color names. There appears to be no tendency to use the term Yellow; this would be intelligible on the hypothesis that the word is very much harder to learn and to say than the other color names. But this hypothesis would not explain why the color is very frequently called 'White,' less frequently 'Red,' sometimes 'Blue' and 'Green,' and scarcely ever 'Black.' It staggers us a little to see that it is called 'Blue' as many times as it is, *though only about as many as would be found on a chance distribution.* Especially are we surprised, since Blue is only once called 'Yellow.'

The green ball was a dark green; the green beads were a light green; we might, therefore, have been disposed to think that the mistakes, 'White' and 'Black,' would be equal in number; but there is, except for 'Red,' no considerable number of errors in which the name 'Black' is used. Green seems to be called in error 'Red,' 'Blue,' and White. It seems good to us adults to call green 'Blue,' especially the dark green; nor does it seem unintelligible to us to call a light green 'White'; but to call green 'Red,' as was done no less than 26 times, seems to us sheer perversion. Would it be quite unreasonable to suppose that there are many cases in which, for children, the term 'Red' embraces all color sensation from the red end of the spectrum up to, and including, the green?

The errors for Blue present some expected results and some difficulties. There is no tendency to confuse with Black, as is decidedly the case with primitive peoples. There are no confusions with Yellow; we should not expect any. The term 'White,' however, is not more frequently applied to the light beads than to the dark blue worsted balls. The outstanding

point is the confusion with Red. Perhaps it is explained thus: 'Red' is the first-color name, Blue is the second; does Red then stand at first rather for color than for Red as we know it? If early color sensation is a much more unitary thing than with us adults, such a condition of nomenclature is not impossible. Adults would expect many confusions of Blue with Green, but there are only five, that is, less than a merely chance number if the errors were scattered equally over all the well-known color names.

Again in the errors for Red there are some difficulties. It is hard to see why the dark red worsted ball should be called 'White,' as it often was, and the light red beads called 'Black,' as they sometimes were. One might fall back on the theory of chance distribution for the Black, Blue and Green; but such a theory would hardly apply to the errors of White and Yellow. 'Blue' is the second color-name acquired and we should perhaps expect that it may, in some cases, even precede 'Red'; for there are certainly considerable individual differences. There are a few confusions with Green, but nothing like the number we should expect if the sensations Green and Red were as closely alike as might appear from the large number of times which Green was called 'Red.' Green we might say is called 'Red,' but Red is not called 'Green.'

Green, of course, is the third color-name in order of acquisition, and hence we might simply regard the errors as the tendency of a well-known name to spread beyond its primary application. The errors could very largely be explained in that way were it not for the small number of times which the word 'Black' is used. Only with the Red does the error 'Black' approximate to its chance number; in all other cases, though a well-known and correctly-applied name, it is not a name given to other colors, whereas the very reverse is the case with 'White.' There are evidently factors operating here which give a distribution of error much unlike what would be found on the solution that the children *just say anything*, if they do not know the right name. They *appear* to be sensorially guided; the names *appear* to be attached or in process of attachment. I do not wish to deny that the child's manner sometimes leads us to believe that he will attach any color name to any color percept, nor that there is, in these cases, a chance distribution of error. But, that another factor is working also, the analysis is sufficient proof.

What is that factor? I suggest that we only need to apply a certain principle a little lower down in the evolutionary scale which we already apply higher up. A person calls Violet 'Blue' or Orange 'Yellow'; or at night he calls Green 'Blue.' "That's very natural," we say; meaning that these colors

look to us so similar that we are not surprised that people sometimes call them by the same name. We should not call Red by the names 'Blue' or 'Green'; nor should we call Blue and Green by the name 'Red.' But children do. Shall we suppose, therefore, that these colors look so much more alike to them that they see no incongruity in using the same name; just as most of us who are not botanists are accustomed to group together all the lovely varieties of the grasses under one undistinguishing term "Grass"?

Would it be hopelessly rash to suggest that color sensation is at first unitary, that it differentiates in the order Red, Blue, Green, Yellow, Violet, Orange? As each part, if this word is applicable, of the *continuum* becomes distinct, it tends as a growing power always does, sensational or conceptional, to be seen as covering too much, and a period of contraction follows: we know what it is and more than it is, and then we know what it is not. By-and-by, if these color 'units' receive names in the order in which they have themselves been differentiated from the color *continuum*, we can, by testing for the names at a later period, find out the order of sensational differentiation at an earlier period.

Obviously, why not try a method, as Garbini did, for testing the color sensations of young children as well as for testing the application of their color names? There will be difficulties here in getting sufficient numbers of unselected children; I mean accidentally selected, of course; using the word accident in its logical sense. On this work I have been employed, on and off, for a year or two, and hope to present the results some day. My purpose, however, in this paper, is to show what may perhaps be inferred from the color names of children who have had approximately equal sensational and verbal environments.